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great teachers of Chinese and Hindoo antiquity;" 10. "While the probability is preëminent that the ancient Americans are of old world origin, and that the Mayas and Nahuas reached this continent from opposite directions, it is certain that the civilization developed by each people is indigenous."

PERUVIAN ANTIQUITIES.—Those who have read with pleasure Squier's "Peru," published by the Harpers in 1877, will, no doubt, be delighted to see the following title and table of contents of the most thorough work on Peruvian antiquities that has yet appeared:

Wiener, Charles. Pérou et Bolivie. Récit de voyage suivi d'etudes archéologiques et ethnographiques et de notes sur l'ecriture et les langues des populations indiennes: Ouvrage contenant plus de 1100 gravures, 27 cartes et 18 plans. Paris, Librairie Hachette et Cie., 79 Boulevard Saint Germain, 1880. Droits de propriété et de traduction réservés. In 1875 M. Wiener was sent by the Minister of Public Instruction of France to Peru and Bolivia upon an archæological and ethnographical mission to last two years. The observations of the author are classed into four groups: 1. Account of his travels; 2. Archæological researches; 3. Observations upon ethnography; 4. Linguistic studies. In giving an account of antiquities, M. Wiener observes that he does not take upon himself the office of the panegyrist nor that of the detractor, but confines himself to an accurate account of the witness of these ancient civilizations, dividing them into three classes, architecture, sculpture and decoration (peinture).

GEOLOGY AND PALÆONTOLOGY.

NOTE ON THE ANDROSCOGGIN GLACIER.—Traces of a local glacier along the valley of the Androscoggin, from the White mountains to West Bethel, Maine, were first discovered by Prof. A. S. Packard, Jr., and Prof. G. L. Vose, and described by them in the first and second volumes of the AMERICAN NATURALIST. The flow of this glacier was subsequent to that of the great ice-sheet. More recently Prof. C. H. Hitchcock has described the glacial drift of this region in the New Hampshire Geological Reports. He also found abundant traces of such a glacier.

During June, 1879, while studying the modified drift of the Androscoggin valley, the writer incidentally noted the signs of the local glacier. The most unique morainal mass which I found in the valley has not, so far as I know, heretofore been described. It is on the south side of the river, just at the State line. The Androscoggin which has been for a mile or two running south-easterly, here abruptly bends to the north-east. Here also the State Line brook, a roaring stream eight or ten feet wide, comes in from the south. It drains a wide mountain basin which inclines down to the Androscoggin by a moderately steep slope. This slope shows a short terrace near the steam; otherwise it is covered with ordinary glacial till, with the exception of a mass of loose morainal materials lying in the woods a short distance east of the brook. A number of white birches and poplars led me into the thicket under a suspicion of kames, and thus I stumbled upon this deposit. Its southern portion (it is separated into two parts by a depression) consists of a ridge from five to fifteen rods wide and rising from ten to thirty feet above the surrounding slopes of the hill. Here are some granite bowlders, closely resembling, if not identical with the outcrop of gneiss found a short distance west of here, near the river. The northern portion consists of a V-shaped mass with the apex south. It is composed of two ridges making the angle of 60° with each other, which are connected on the north by an irregularly curved ridge, the whole enclosing a shallow funnel or "potash kettle." Of these the western ridge is prolonged somewhat to the north of the cross ridge in the form of a row of conical hillocks which reach down nearly to the upper terrace of the river valley. This western ridge is nearly in line with the southern ridge first described (perhaps they are really one ridge), and both bear nearly due magnetic north, thus crossing the State line obliquely. From the eastern ridge a short spur juts to the south. The northern end of these ridges must rise fifty or more feet above the underlying hill. The ridges all slope outward in all directions, often as steeply as loose materials will lie.

By aneroid the height of the ridges above the river varies from 180 to 200 feet, and perhaps there were places a little higher than those measured. In places the materials show signs of water-wash, with a loose structure as of gravelly upper till. Along the south bank of the Androscoggin are many morainal masses left by the great glacier, but this is evidently a very different deposit. Considering the shape of the mass, its situation, its height, its materials and the steepness of its slopes, I regard it as a moraine of the local glacier. It is one-third of a mile long and at one point is about one-eighth of a mile wide.

The significance of this moraine becomes more evident after examining the north side of the river opposite. Here a high hill called Hark hill, stands far out into the valley in the angle between the Androscoggin and a stream that comes in from the N. N. W. Hark hill is separated from the cliffs that form the northern walls of the Androscoggin valley toward the north-west by a low valley in which is found an extensive moraine. This deposit ends on the east and north-east in a steep bank or bluff from twenty to forty feet high, overlooking the interval of the lateral stream above mentioned. It contains many angular bowlders and sometimes an angular gravel, as if little water worn. This deposit is not valley drift, and for the most part does not appear to be ordinary till. I marked it as a lateral moraine of the valley glacier, though not very positively. Its height was not measured, but cannot be much, if any, more than one hundred feet above the river. No grooves of the local glacier could be found on the north side of Hark hill, though they are beautifully developed everywhere on the south side of the hill next the river.

On the south-east shoulder of Hark hill is found a morainal ridge. It bears N. 20° W., which was so near the direction of the flow of the continental glacier that I carefully examined the northern end of the deposit to see if it was a "tail" to a spur of the hill. It ends on the north at a height by aneroid of about one hundred and ninety feet above the river, terminating as a steep ridge of loose materials piled up to a height of ten or fifteen feet above the surrounding slopes of the hill. Its length is about one-fourth of a mile. It is evidently a moraine of the local glacier, and is described as such by Prof. Hitchcock.

Here then at this bend of the river, at the State line, are two remarkable moraines lying transverse to the valley and directly opposite to each other. Each begins at a point about two hundred feet above the river and reaches down nearly or quite to the upper terrace of the valley drift. The larger moraine is on the south side of the river, and almost in a line with the glacier's axis for a mile or two up the valley. It appears as if the local glacier here paused in its recession for a time long enough to form a terminal moraine of considerable size. That part of the moraine which was within reach of the swollen river would naturally be washed away or buried out of sight during the period of the deposition of the valley drift.

We have already referred to the lateral valley that comes from the N. N. W. past the north-east base of Hark hill. In the lower part of this valley is an arrangement of the modified drift which deserves notice. Here is a plain composed of steepish reticulated ridges of sand, gravel and pebbles, enclosing a small pond and numerous funnels. The external appearance of these ridges is decidedly kame-like. Their tops are on nearly the same level as the upper terrace along the river, and in fact they appear like an extension of the drift of the Androscoggin valley running back into this lateral valley for a half mile. They then drop down suddenly into a wide, level interval which reaches entirely across the valley and shows no distinct signs of terraces, at least on the south side. This interval shows hardly a pebble, nothing but a fine silt of great fertility. Time did not permit its exploration, but I was informed that it reaches two miles or more back from the river. For the first half mile from the river the lateral stream has eroded thirty or more feet into the valley drift and kame-like ridges, but its flood plain is not many rods wide. Then comes the wide interval, and although the stream meanders through it by several channels, yet the size of the interval, the fineness of its materials, and the absence of well-defined terraces, make it very unlikely that this low flat was excavated in valley drift. At least, if so, the drift must have been of unusually fine materials.

The currents which deposited these kame-like ridges may have swept toward the Androscoggin valley or away from it. The abruptness with which the ridges end on the north-west, favors the latter theory, though this could not be confirmed by lines of stratification, as no fresh exposures could be found. At Shelburne the valley of the Androscoggin abruptly widens, and there has evidently been a lateral sweep of the currents, but I nowhere in the valley saw these oblique ridges actually turning back toward the west unless it be here at the State line. The appearances could be accounted for by supposing that during the deposition of the valley drift, in times of sudden flood, powerful currents overflowed into the lateral valley until it was filled with water. Coarse materials would be carried for a limited distance and the finer would be deposited over that wide interval, which would for the time being be a lake. Or it may be that a part of these ridges were true kames, deposited in ice channels along the flanks of the valley glacier during its final melting. In any case it is difficult to see how the currents could have come from the north-west without leaving some traces of gravel ridges in that direction.

Thus far no decisive evidence can be found that the Androscoggin glacier flowed eastward of West Bethel. Many morainal ridges cross the valley but none of them appear to have been deposited by the local glacier, unless it be a line of hillocks and ridges just west of the valley of the Sunday river, below Bethel. A minute examination may show this deposit to be a moraine of the Androscoggin glacier.—*George H. Stone.*

MARSH ON JURASSIC DINOSAURIA.—In the March, 1880, number of the *American Journal of Science and Arts*, Prof. Marsh gives an account of the Dinosaurian *Stegosaurus ungulatus*, of which he has come into possession of an unusually complete skeleton. He finds the genus to be possessed of very distinctive characters, which are as follows:

"(1.) All the bones of the skeleton are solid; (2.) The femur is without a third trochanter; (3.) The crest on the outer condyle of the femur which in birds separates the heads of the tibia and fibula, is rudimentary or wanting; (4.) The tibia is firmly coössified with the proximal tarsals; (5.) The fibula has the larger extremity below." Prof. Marsh abandons the order *Stegosauria* which he formerly proposed, and refers the genus to the *Dinosauria*, to a special group. *Stegosaurus ungulatus* was thirty feet long, and walked on its hind limbs; its back was protected by bony scuta, and its food was probably vegetable.

ARCHÆOPTERYX.—In 1863 M. Häberlein discovered in the lithographic stone of Solenhofen (Bavaria) a fossil bird, the Archæopteryx, which was described by Owen, and a restoration of it is to be found in several of the recent manuals of Geology. More recently, M. Häberlein, Jr., has found in the same place another slab containing a complete and most perfect specimen of Archæopteryx. The examination of that specimen modified some previous conclusions. The wings are spread out as for flight. Two small, pointed, conical teeth are implanted in the upper jaw. The hands cannot be compared with those of a bird or of a pterodactyl; they resemble those of a three-fingered lizard. The fingers are long, slender and provided with sharp claws. The wing-feathers (remiges) are attached all along the outer side of the arm and hand; had they not been preserved, no one would have suspected, from the examination of the skeleton alone, that the animal was winged. The remiges do not overlap each other; the proximal end of the shaft is covered with down; the outline of the wings is rounded like that of the hen. The head, neck, chest, ribs, tail, thoracic girdle, and front limbs of that fossil are characteristically reptilian; the pelvis was also probably more reptilian than avian. On the contrary, the legs are bird-like; they resemble most those of the falcon, inasmuch as they are covered with feathers. To every caudal vertebra was attached a pair of lateral quills. The remainder of the body was evidently naked and featherless, with perhaps the exception of the base of the neck, where there are indications of a collar of feathers like that of the condor.

Karl Vogt, to whom science is indebted for several of the foregoing facts, says that it is superfluous to discuss the question as to whether the Archæopteryx is a bird or a reptile. It is neither; it is an intermediate type by itself, and confirms the views of Huxley, who classes together the birds and reptiles, under the name of Sauropsida, as one of the great divisions of vertebrates.

THE MANTI BEDS OF UTAH.—In a previous number (May, 1879) of this journal I showed that the palæontological evidence is opposed to the identification of the "Amyzon" beds of Nevada and Colorado with the Green River formation, and that the former are probably of later origin. There is, however, a series of calcareous and silico-calcareous beds in Central Utah, in Sevier and San Pete counties, which contain the remains of different species of vertebrates from those which have been derived from either the Green River or Amyzon beds. These are *Crocodilus*, sp., *Clastes cuneatus* Cope, and a fish provisionally referred to *Priscacara* under the name of *P. testudinaria* Cope. There is nothing to determine to which of the Eocenes this formation should be referred, but it is tolerably certain that it is to be distinguished from the Amyzon beds. In its petrographic characters it is most like the Green River, as it consists in large part of shales. The laminæ are generally thicker than those of Green and Bear River. The genera *Crocodilus* and *Clastes* have not been found heretofore in

Green River beds, although they are abundant in the formations deposited before and after that period. Until its proper position can be ascertained, I propose that the formation be called the Manti beds.—*E. D. Cope.*

The Skull of Empedocles.—This genus, originally described[1] from vertebræ, proves to be allied to *Diadectes*, and to be one of the most remarkable forms of the Permian fauna. With that genus it forms a family, the *Diadectidæ*. The skull of *E. molaris*[2] displays the following characters:

The relations of the quadrate and zygomatic arches are as in the *Theromorpha* generally. The pterygoids extend to the quadrates, and the vomer bears teeth. The brain-case extends to between the orbits, and its lateral walls are uninterrupted by fissures from this point to near the origin of the *os quadratum*. There is an enormous frontoparietal foramen. The mode of connection with the atlas is peculiar. There is a facet on each side of the *foramen magnum*, which then expands largely below them. The bone which bounds it inferiorly, presents on its posterior edge a median concavity. On each side of this, is a transverse cotylus, much like those of an atlas which are applied to the occipital condyles of the *Mammalia*. They occupy precisely the position of the Mammalian condyles. The median point of their upper border, which forms the floor of the foramen magnum, is produced in the position occupied by the median occipital condyle of a reptile. From its position between the cotyli, the section of this process is triangular. The element in which the cotyli are excavated has the form of the mammalian basioccipital, and of the reptilian sphenoid. It is not the batrachian parasphenoid. Its extreme external border on each side where it joins a crest descending from the exoccipital, is excavated by a circular fossa which looks outwards.

The character of this articulation is so distinct from anything yet known among vertebrated animals, that I feel justified in proposing a new division of the *Theromorpha* to include the *Diadectidæ*, to be called the *Cotylosauria*.

It will be remembered that in *Diadectes* the maxillary teeth are transverse, and molar-like. There is a distinct canine. In *Empedocles* there is no distinct canine, but the incisors are distinguished by their form, having more or less distinct transverse edges. For the present I refer *D. latibuccatus* to *Empedocles*.—*E. D. Cope.*

GEOGRAPHY AND TRAVELS.[3]

The Interior of Greenland.—The Danish Government having recently instituted an examination by a scientific commission of the interior of Greenland, has now published the first part of

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[1] Proceed. Amer. Philos. Soc., Phila., 1878, p. 516.

[2] *Diadectes molaris* Cope, Amer. Naturalist, 1878, p. 565.

[3] Edited by Ellis H. Yarnall, Philadelphia.